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Indian Standard
SPECIFICATION FOR TEMPORARY CORROSION PREVENTIVES, STRIPPABLE, HOT-DIPPING TYPE

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *July* 1971

Indian Standard
SPECIFICATION FOR TEMPORARY CORROSION PREVENTIVES, STRIPPABLE, HOT-DIPPING TYPE

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Indian Standard
SPECIFICATION FOR TEMPORARY CORROSION PREVENTIVES, STRIPPABLE, HOT-DIPPING TYPE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 1 February 1971, after the draft finalized by the Lubricants and Related Products Sectional Committee had been approved by the Chemical Division Council and the Mechanical Engineering Division Council.

0.2 The material prescribed in this standard is generally of a rubber-like consistency at room temperature, and is melted for application. It is usually based on ethyl cellulose, cellulose acetate, polyvinyl acetate, etc, with small amounts of mineral or fatty oils incorporated together with suitable plasticizers, resins and stabilizers. It is applied on metal surfaces by melting the material in a tank and dipping the article into it in order to give a strippable, corrosion preventive film during the storage and transit of the article. It is intended for metallic components made of steel, copper or aluminium, such as precision tools, gears, dies, drill bits, bearings, gauges, surgical instruments, small assemblies and costly spare parts of sewing machines, aircraft, transport vehicles, etc.

0.3 The thickness of the coated film may be varied at the discretion of the user by treating the material at different temperatures or by warming the article to a suitable temperature, or by both. Since the range of temperatures within which it is possible to get a film of suitable thickness depends on the base material, the manufacturer should declare this range for the benefit of the actual user (*see* **2.2**).

0.4 The strippable film coating on an article offers corrosion protection for about a year or more. The material stripped from the article may be melted and re-used for the same purpose over again.

0.5 Besides corrosion protection, this material also provides good mechanical protection to the surfaces of the finished components. For ensuring this, it has been found desirable to stipulate a suitable test for the ability of the material to resist puncturing or tearing in addition to the tensile strength characteristics already included. The requirement for puncturing or tearing will be included later as soon as sufficient data becomes available.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for strippable hot-dipping type temporary protectives suitable for metal parts such as steel, copper and aluminium during storage and transport.

2. REQUIREMENTS

2.1 **Description** — The material shall be fairly transparent, hard enough to handle and free of grit, dirt or any foreign substance likely to interfere with the serviceability of the compound. The material shall also be safe to handle and shall not emit any harmful and objectionable fumes when melted for application.

2.2 **Dipping Temperature** — The temperature of the melted material recommended for actual use is not specified; but the manufacturer shall indicate the range, that is the maximum and the minimum dipping temperature for optimum performance of the product.

2.2.1 The manufacturer shall also declare the dipping temperature falling within the range specified in **2.2** at which the test for thickness determination is to be done.

2.3 **Fire Point** — The fire point of the initial material when tested by the method prescribed in **A-13** shall not be lower than the temperature 20°C above the maximum dipping temperature (*see* **2.2**)

2.4 In respect of other characteristics, the material shall comply with the requirements given under Table 1 when tested as in **A-4** to **A-12**.

2.5 **Keeping Qualities** — The keeping qualities of the material shall be such that when stored in original sealed container under normal conditions, they shall retain the properties detailed in this standard for not less than 12 months after delivery.

3. PACKING AND MARKING

3.1 **Packing** — The material shall be packed in the form of blocks in wooden boxes lined with polyethylene films or any other suitable container as agreed to between the purchaser and the supplier.

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*Rules for rounding off numerical values (*revised*).

TABLE 1 REQUIREMENTS FOR TEMPORARY CORROSION PREVENTIVES, STRIPPABLE, HOT-DIPPING TYPE

(*Clause* 2.4)

Sl No.	Characteristic	Requirement	Method of Test
(1)	(2)	(3)	(4)
i)	Homogeneity	Shall pass the test	A-4
ii)	Strippability of the film	Shall pass the test	A-5
iii)	Film thickness:		
	a) *From Initial Material*:		A-6.1
	1) Mean of any strip	1·3 to 2·5	
	2) Difference between any individual thickness and the mean thickness in a strip, *Max*	0·18 mm	
	3) Difference between the mean thickness of the three strips, *Max*	0·4 mm	
	b) *From Aged Material*:		A-6.2
	Difference between the means of three initial and three aged strips, *Max*	20 percent	
iv)	Transparency of 2 mm thick film of the material deposited over material surface	Shall pass the test	A-7
v)	Flexibility of the film	Shall pass the test	A-8
vi)	Tensile strength, kgf/cm^2, *Min*		A-9
	a) Initial material	19·3	
	b) Aged material	16·0	
vii)	Elongation at break for initial material, percent, *Min*	50	A-9
viii)	Compressibility (change in height of test piece) mm, *Max*	2·5	A-10
ix)	Exudation (loss in weight), percent, *Max*	5	A-11
x)	Corrosion resistance	Shall pass the test	A-12

3.2 Marking — The container shall be marked with the name and weight of the material in the container; name of the manufacturer, and his recognized trade-mark, if any. In addition, the recommended range of the dipping temperatures for the actual use of the material (*see* **2.2**), and the dipping temperature (*see* **2.2.1**) for test purposes shall also be indicated.

3.2.1 The containers may also be marked with the ISI Certification Mark.

Note — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

4. SAMPLING

4.1 Representative samples of the material and the criteria for conformity shall be as prescribed in Appendix B.

APPENDIX A

(*Clauses* 2.3, 2.4, and *Table* 1)

METHODS OF TESTS FOR TEMPORARY CORROSION PREVENTIVES, STRIPPABLE HOT-DIPPING TYPE

A-1. APPARATUS

A-1.1 Ovens — thermostatically maintained at the desired temperature.

A-1.2 Humidity Cabinet — suitably designed so that a relative humidity of 100 percent is maintained by evaporation of water from a reservoir situated at the bottom. The water shall be heated by a heater completely immersed in the water. The temperature of the air space shall be controlled thermostatically so that it lies between 40 and 42°C. The air space in the cabinet shall be maintained at a uniform temperature within ± 0·5°C at any point by means of a suitable air-circulating fan.

A-1.3 Glass Beaker — for melting the material.

A-1.4 Cleveland (Open) Cup Apparatus With Thermometer — as prescribed in P : 69 (1969) of IS : 1448*.

A-2. MATERIALS AND REAGENTS

A-2.1 Steel Panels — 75 × 50 × 3 mm size made from cold finished steel conforming to Grade C 25 of IS : 1570-1961† with rounded edges and corners each having a 5-mm hole with its centre in the middle of its length and at a distance of 5 mm from one long edge. Each panel shall be provided with a suitable suspension wire of copper passing through the hole. Before carrying out tests, each panel shall be hand polished with Grit No. 240 emery grain (*see* IS : 3178-1965*) and a suitable emery cloth, washed with a suitable volatile solvent, wiped and cleaned in such a manner that there are no lints or finger prints left on the surface of the panel. Before use, each panel shall be kept in a desiccator for one hour.

---

*Methods of test for petroleum and its products : Flash and fire point by Cleveland (open) cup.

†Schedules for wrought steels for general engineering purposes.

A-2.2 Iron Rod — smooth and straight, 3 mm in diameter.

A-2.3 Sodium Chloride Solution — 5 percent (*w/w*).

A-3. QUALITY OF REAGENTS

A-3.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1960†) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-4. TEST FOR HOMOGENEITY

A-4.0 The test is performed on the initial and the aged material prepared as in **A-4.1.1** and **A-4.1.2**. The same procedure for preparing the initial and the aged materials shall be followed for the other tests also where such materials are stipulated for the tests.

A-4.1 Procedure

A-4.1.1 *Initial Material* — Cut the material into cubes of about 25 mm side, place about 600 g of the cut pieces in a one-litre glass beaker and heat it in an oven at the specified dipping temperature (*see* **2.2.1**) within ± 2°C. After attaining the molten condition, heat it for 2 hours. Observe the material for homogeneity (*see* **A-4.2**) and preserve it for further testing.

A-4.1.2 *Aged Material* — Cut the material into cubes of about 25 mm side, place about 1 200 g of the cut pieces in a 1·5-litre glass beaker of about 100 mm diameter and 200 mm height, cover with a watch glass and heat in an air-oven at the specified dipping temperature (*see* **2.2.1**) within ± 2°C. After attaining the molten condition, heat it for 48 hours. Observe the material for homogeneity (*see* **A-4.2**), and preserve it for further testing.

A-4.2 The initial and the aged material shall be taken to have passed the homogeneity test if the molten material on observation reveals no skinning, gelling, or phase separation from the molten mass.

---

*Specification for abrasive emery grain.

†Specification for water, distilled quality (*revised*).

A-5. TEST FOR STRIPPABILITY OF FILM

A-5.1 Procedure — Suspend 3 steel panels (*see* **A-2.1**) into the molten compound (*see* **A-4.1.1**) for a period of 5·0 ± 0·5 seconds. Remove the panel quickly without jerks and allow it to drain without shaking it or giving it any jerky motion. Keep the panels at room temperature for 24 hours. Remove the coating from the bottom and side edges with a sharp knife inserting the blade of the knife below the coating for a distance of not more than 1·2 mm. Pull the strip gently in a continuous sheet.

A-5.2 The material shall be taken to have passed the test if the film could be stripped in a continuous sheet.

A-6. TEST FOR FILM THICKNESS

A-6.1 Procedure — On each of the stripped coatings obtained in **A-5.1**, measure the thickness at side places, selected at random from the strip, leaving a border of 1 cm.

A-6.1.1 Report the thicknesses measured at each of the 6 places in a strip and their average, and the grand mean for all the 3 strips.

A-6.2 Repeat the above procedure on films prepared from the aged material (*see* **A-4.1.2**) and report the mean thickness of the strips.

A-7. TEST FOR TRANSPARENCY OF 2-mm THICK FILM

A-7.1 Procedure — Keep a stripped film obtained in **A-5.1** with a thickness of not more than 2 mm at room temperature for 24 hours over a typewritten sheet of white paper. The material shall pass the test if the type script is clearly readable through the film.

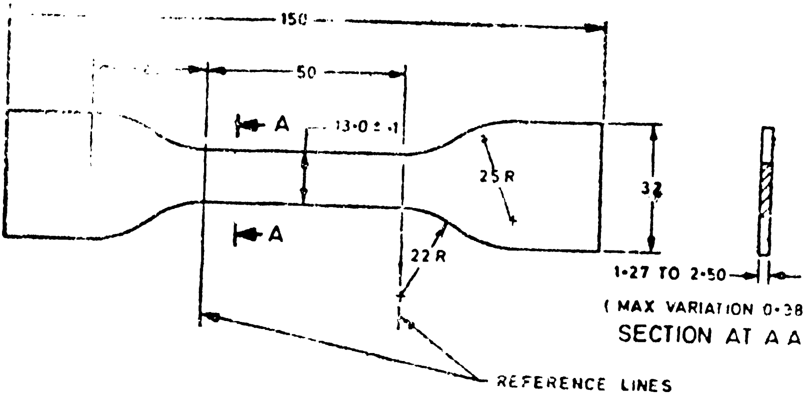
A-8. TEST FOR FLEXIBILITY OF THE FILM

A-8.1 Procedure — Take a stripped film (*see* **A-5.1**) of the corrosion protective and bend it slowly through an angle of 180° around an iron rod (*see* **A-2.2**). Straighten the film and examine it. The material shall pass the test if the stripped film shows no evidence of fracture.

A-9. TEST FOR TENSILE STRENGTH AND ELONGATION AT BREAK

A-9.0 General — The test is performed on test pieces cut out from the strip of the initial (*see* **A-4.1.1**) and the aged material (*see* **A-4.1.2**).

A-9.1 Preparation of the Test Pieces — Prepare a stripped film as described in **A-5.1**, but using a steel panel of 15 × 10 cm for the initial material (*see* **A-4.1.1**). Cut out 6 test pieces from each with an appropriate die to the outline and dimensions shown in Fig. 1, using a single stroke of a suitable press. Mark the reference lines perpendicular to the long axis at the positions shown in Fig. 1. Condition the test pieces for 24 hours at 27 ± 2°C before carrying out the test. Reject the test pieces that show flaws or irregularities.



All dimensions in millimetres.

Fig. 1 Test Piece Used for Tensile Strength and Elongation Determinations

A-9.2 Procedure

A-9.2.1 Measure the thickness of the test piece at 5 points between the reference lines. Use the mean (*see* Note) of these to calculate the mean area of cross-section of the test piece, after rounding it off to the nearest 0·02 mm.

Note — This mean thickness shall be within ± 10 percent of the grand mean thickness as obtained in **A-6.1.1**. Also, no single reading of the thickness on a test piece shall differ from the mean thickness of that test piece by more than 0·18 mm.

A-9.2.2 Measure the width of the narrowest part of the die used for cutting the test piece to the nearest 0·02 mm. Use this to calculate area of cross-section of the test piece.

A-9.2.3 Carry out the tensile strength test on the test piece using a suitable testing machine having a rate of traverse of the lower grip of 13 ± 1 cm/min, and measure the breaking load.

A-9.3 Calculate the tensile strength and percentage elongation (between the reference lines) at break for each test piece. Report the average for the 6 test pieces.

A-9.3.1 Repeat the test on the aged material (*see* **A-4.1.2**) and determine these values.

A-10. TEST FOR COMPRESSIBILITY

A-10.0 General — The test is performed on test pieces moulded from initial (*see* **A-4.1.1**) and the aged material (*see* **A-4.1.2**).

A-10.1 Preparation of Test Pieces — Five cylindrical test pieces of the material 12·00 ± 0·08 mm high and 12·00 ± 0·08 mm diameter shall be cast in suitable moulds. Such moulds may be made by drilling 12-mm holes in a 12-mm mild steel plate or flat bar. Sufficient material shall be cast into and over the moulds so that, after cooling and trimming, there are no pockets or depressions in the cylinders.

A-10.2 Procedure — Keep the test pieces one by one in the air-oven, having a reinforced shelf, at 70 ± 1°C for a period of 24 hours. With the test piece still in the oven, apply a load of 5 kg on its upper surface. The load is to be applied vertically and evenly by means of freely moving parallel plates of at least 8 cm diameter. After 5 minutes remove the test piece and measure its height immediately.

A-10.2.1 Report the average change in height of the 5 test pieces after loading. Also examine the test pieces for cracking or tearing.

A-11. TEST FOR EXUDATION (LOSS IN WEIGHT) OF THE MATERIAL

A-11.1 Procedure — Take 3 pieces of the stripped film (*see* **A-6.1**) and carefully blot, wipe, weigh and hang in an oven at 70 ± 1°C for a period of 24 hours. After this remove the pieces from the oven, cool to room temperature and carefully wipe any free liquid on the surface of the pieces with a clean absorbent cloth. Reweigh and take the average loss of weight of 3 pieces and calculate the percentage.

A-12. TEST FOR CORROSION RESISTANCE

A-12.1 Resistance to High Humidity

A-12.1.1 *Procedure* — Coat 3 steel panels prescribed in **A 2.1** in accordance with the procedure prescribed in **A-5.1** but dip them twice into the molten material and keep them at room temperature for about 2 hours. Keep the panels for 720 hours in a humidity cabinet (*see* **A-1.2** maintained at 42 to 48°C.

A-12.1.1.1 After this period take out the panels carefully, strip off the film and examine them. The material shall be regarded as resistant to high humidity if the panels show no evidence of corrosion.

A-12.2 Resistance to Temperature Cycling

A-12.2.1 *Procedure* — Coat 3 steel panels prescribed in **A-2.1** in accordance with the procedure prescribed in **A-5.1** but dip then twice into the molten material and keep them at room temperature for about 24 hours Subject the panels to the following cycle 5 times:

a) 16 hours in the humidity cabinet (*see* **A-1.2**),
b) 3 hours at a temperature of — 10 ± 1°C,
c) 2 hours at a temperature of 70 ± 1°C, and
d) 3 hours immersion in a 5-percent sodium chloride solution at room temperature.

NOTE — If it is necessary to interrupt this cycle for 24 hours (permitted only once), the panels shall be left in the humidity cabinet for the period, and this period shall not count as part of the cycle.

A-12.2.1.1 After completing the 5 cycles, take out the panels, carefully strip off the film and examine them. The material shall be regarded as resistant to temperature cycling if the panels show no evidence of corrosion.

A-13. DETERMINATION OF FIRE POINT

A-13.1 Procedure — Fill the Cleveland (open) cup to the filling line by melting the material in the cup at a temperature not exceeding 175°C, stirring throughout the operation to ensure a uniform melt and to avoid local overheating. Suspend the thermometer in the manner prescribed in **4.3** of P : 69(1969) of IS : 1448* and also use the thermometer to stir the material by rotating around the cup maintaining the same position relative to the cup, at 2 cycles/second. Heat the sample so that the temperature rises at a rate of 5·0 ± 0·5°C/min. Apply the test flame at 30-second intervals that is at approximately every 3°C rise in temperature interrupting the stirring momentarily for this purpose. Record the fire point as the temperature at the time of the flame application which causes burning for a period of 5 seconds or more.

APPENDIX B

(*Clause* 4.1)

SAMPLING OF TEMPORARY CORROSION PREVENTIVES STRIPPABLE, HOT-DIPPING TYPE

B-1. SCALE OF SAMPLING

B-1.1 Lot — All the containers of the material belonging to the same batch of manufacture shall be grouped to constitute a lot.

---

*Methods of test for petroleum and its products: Flash and fire point by Cleveland (open) cup.

B-1.2 The number of containers to be selected for sampling shall depend on the size of the lot and shall be as given below:

Number of Containers in the Lot *N*	*Number of Containers to be Sampled* *n*
Up to 10	2
11 to 25	3
26 to 50	5
51 to 100	7
101 and above	9

B-1.2.1 These containers shall be selected at random. For this purpose a random number table shall be used. If it is not available the following method may be applied:

> Arrange all the containers as 1, 2, 3, *r*,......up to *N* where *r* is the integral part of *N*/*n* (*see* **B-1.2**). Every *r*th container shall be withdrawn to give the required sample size.

B-1.3 From each of the containers selected, approximately 1 kg of material shall be cut from as many blocks as possible. The material collected in this way, from each sampled container, shall be melted. The molten material shall be mixed thoroughly to form the composite sample.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 Tests for all the characteristics given in **2** shall be conducted on the composite sample.

B-2.2 The lot shall be considered as satisfactory if all the test results satisfy the corresponding requirements given in col 3 of Table 1.

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